BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 193 917**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **86102752.2**

(22) Date of filing: **03.03.86**

(51) Int. Cl.⁴: **A 61 K 9/18**, A 61 K 47/00
// A61K37/24, A61K37/36

(30) Priority: **29.03.85 US 717417**
06.03.85 SE 8501094
20.02.86 US 830158

(43) Date of publication of application: **10.09.86**
Bulletin 86/37

(84) Designated Contracting States: **AT BE CH DE FR GB IT LI LU NL SE**

(71) Applicant: **AMERICAN CYANAMID COMPANY, 1937 West Main Street P.O. Box 60, Stamford Connecticut 06904 (US)**

(72) Inventor: **Cady, Susan Mancini, 1501 Revere Road Yardley, Bucks County, Pennsylvania 19067 (US)**
Inventor: **Fishbein, Richard, 16 Meadow Run Drive, Skillman New Jersey 08558 (US)**
Inventor: **Schroder, Ulf, Ferievagen 9, S-223 67 Lund (SE)**
Inventor: **Eriksson, Hakan, Prennegatan 4B, S-223 53 Lund (SE)**
Inventor: **Probasco, Brenda Lee, 64 Evergreen Road, New Egypt New Jersey 08533 (US)**

(74) Representative: **Wächtershäuser, Günter, Dr., Tal 29, D-8000 München 2 (DE)**

(54) **Water dispersible and water soluble carbohydrate polymer compositions for parenteral administration.**

(57) The present invention relates to compositions of water dispersible and water soluble carbohydrate polymers and biologically active macromolecules of growth hormones, somatomedins, growth factors, and other biologically active fragments which are suitable for parenteral administration. The present invention also relates to a method for increasing and for maintaining increased levels of growth hormone in the blood of treated animals for extended periods of time, increasing weight gains in animals, and increasing milk production of lactating animals by the administration of the compositions of the invention.

EP 0 193 917 A2

SUMMARY OF THE INVENTION

The invention includes biologically active compositions including water solutions of a biologically active macromolecule and a carbohydrate.

We have found that the compositions of the invention provide sustained release of growth hormones when administered parenterally as solutions, dispersions and pastes.

The invention relates to compositions for parenteral administration comprising a water soluble or water dispersible carbohydrate polymer, or a mixture of carbohydrate polymers, and a biologically active macromolecule, and water, or a buffered solution, or a pharmaceutically and pharmacologically acceptable solvent. The invention includes a method for administering and maintaining blood levels of biologically active macromolecules comprising parenterally administering compositions of the invention. The invention also includes a method for increasing milk production in dairy cows comprising parenterally administering compositions of the invention to the cows.

Biologically active macromolecules of the invention include e.g., growth hormones, somatomedins, growth factors, and other biologically active fragments. These macromolecules include growth hormones for example bovine, ovine, equine, porcine, and human growth hormones. However, other biologically active macromolecules may also be used within the scope of the invention, such as insulin.

Carbohydrates, such as dextran and starch, have until now been assumed to be inert regarding their capability to adsorb high molecular weight substances such as proteins. As an example of this it may be mentioned that dextran is used for the preparation of covalently crosslinked spheres (Sephadex, Pharmacia AB). These spheres are used for purification and for chemical characterization of proteins where very high demands on low unspecific adsorbtions of the proteins to the matrix are needed.

However, as described in this invention, when some carbohydrates are in solution, strong and not previously described interactions between carbohydrates and proteins are obtained. These interactions are very strong, and strong dissociating substances in high concentrations are needed to break the interaction between the carbohydrate and the protein.

Polymers preferred for use in the invention include carbohydrate polymers such as the dextrans, dextrins, alginates, starches and fractionated starches, glycogen, pullullan, agarose, cellulose, chitosan, carrageenan, and synthetic biopolymers, as well as gums such as xanthan gum, guar gum, locust bean gum, gum arabic, tragacanth gum, and karaya gum, derivatives thereof and mixtures thereof. These carbohydrate polymers, many of which are classified as polysaccharides or oligosaccharides or derivatives thereof, have the desirable properties of being inert to biological systems; they are well characterized and nontoxic; they are excretable from the body by normal routes; and, due to their water solubility and dispersion characteristics, they may readily be administered in aqueous compositions. The term water solubility for these polymers is meant to include the range of colloidal solution and dispersions.

Solvents suitable for use in the compositions of this invention include phosphate buffered saline (PBS) which contains $NaH_2PO_4 \cdot H_2O$ (0.025 Mol), Na_2HPO_4 (0.025 mol), and NaCl (0.15 mol) which has been adjusted to pH 7.1; and Carbonate Buffer Saline (CBS) which contains Na_2CO_3 (0.025 mol), $NaHCO_3$ (0.025 mol), and NaCl (0.15 mol) which has been adjusted to pH 9.4; and saline; alone in combination with other pharmaceutically and pharmocologically acceptable water miscible solvents.

Pharmaceutically and pharmacologically acceptable solvents frequently employed in biological preparations for parenteral administrations include a variety of liquid alcohols, glycols, esters, and amides. As such, these solvents find utility in the compositions of this invention.

The invention includes a way of preparing such compositions, including the complex formation of a protein to carbohydrate in a water solution, together with hydrophobic or a hydrophilic substance that may interfere with hydrophobic or hydrophilic interactions in the complex.

Additionally complex formation may be effected by methods already well-known in the literature which describes the derivatization of carbohydrates with various hydrophobic or charged moieties. Examples of hydrophobic derivatives can be mentioned such as cholesterol or Cibachrome blue, or charged groups such as sulfate or amino groups.

Hence, it is possible to influence complex formation by the use of various hydrophobic and/or hydrophilic substances that influence the hydrophobic or hydrophilic interactions in the complex during the formation of the complex.

Additionally, stabilizers and preservatives such as acids, esters, organic ammonium halides, sulfides, alcohols, amines, anilides or organomercury compounds at concentrations of up to 0.2% on a weight to volume basis may be added to the compositions of the invention to improve their stability. Preferred stabilizers for compositions of the invention include dehydroacetic acid and salts thereof, the sodium salt being most preferred; salicylanilide; sorbic acid and salts thereof, the potassium salt being most preferred; sodium nitrite and sodium nitrate.

By the use of detergents which break hydrophobic interactions, it has now been shown that it is this type of interaction which is dominating for some carbohydrates. A complex has, according to this invention, a size below 50 nanometer, but despite this, a complex bound protein can not be detected with the help of antibodies through an ELISA determination. That polyclonal antibodies are not able to be bound to the protein suggests that the protein is hidden by a carbohydrate.

It has now, suprisingly, been shown, that despite above-mentioned hiding, the protein still has its biological activity, since after injection in an animal, continuous and uniform dissociation of the complex over ten days is obtained. The dissociation in vivo is obtained with the help of the detergent systems within the body, i.e. systems that influence the hydrophobic or hydrophilic interactions in the complex. Alternatively one may, when preparing a complex, add such a substance like a detergent to ease the dissociation of the complex.

Preferred compositions of the invention are comprised of soluble carbohydrate polymer to biologically active macromolecule ratios on a weight basis of from 0.25/1.0 to 100.0/1.0. Soluble carbohydrate polymer to solvent ratio will of course vary depending upon the solubility of the carbohydrate and solvent employed. These preferred compositions having soluble carbohydrate polymer to biologically active macromolecule ratios of from 1.0/1.0 to 100/1 may be administered as aqueous pastes or solutions in water or buffered saline solutions. Higher ratios of water soluble polymer may of course also be employed. The quantity of water or buffered saline solution may vary depending upon the carbohydrate polymer and its solubility characteristics, as may the pH of the buffered saline solution. Aqueous compositions of the invention administered in vivo in a pH range of from about pH 3.0 to pH 10.0 having water to carbohydrate polymer ratios of 0.83 to 1 to 4.0 to 1 have been effective for administering and maintaining increased levels of biologically active macromolecules in vivo.

Especially preferred compositions of the invention are with bovine growth hormone, and water, aqueous buffer solution, or saline include dextrin; dextran; a heteropolysaccharide of glucose, galactose, mannose, glucuronic acid and fucose (Biopolymer PS-87 Lever Brothers Company), as described in United States Patent 4,357,423; and mixtures of xanthan gum with locust bean gum.

The invention is further illustrated by the following nonlimiting examples.

EXAMPLE 1

Preparation of an aqueous bovine growth hormone composition

A low viscosity corn dextrin (18g), having the properties of being acidic as a 25% dispersion with a viscosity of 50 centipoise at 25°C, and bovine growth hormone (0.18g) is admixed with 15 ml of carbonate buffer saline, pH 9.4 (Na_2CO_3, 0.025 mol; $NaHCO_3$ 0.025 mol; and NaCl 0.15 mol) until a homogenous paste is obtained.

EXAMPLE 2

Evaluation of growth hormone compositions of the invention in dairy cows

Nine lactating cows are divided into three groups of three. Throughout the test, all cows are fed the same ration of corn silage, alfalfa hay, and dairy concentrate adequate to produce 25 kg to 30 kg of milk per day. The cows are not treated for one week and daily milk production and bovine growth hormone blood levels obtained for each group of three animals. The experimental treatments listed in Table I below are administered during weeks two, three and four and the bovine growth hormone blood levels determined at two, four and six hours after injection and daily thereafter by established radioimmumoassay procedures.

TABLE I

Treatment Administered

A. Control - 3 cows

B. bGH in dextrin solution. 175 mg bGH once/week - 3 cows

C. bGH in buffered saline, 25 mg bGH/day - 3 cows

All injections are administered subcutaneously.

The results of these experiments which are summarized in Table II below demonstrate the effectiveness of the compositions of the invention in providing sustained release of bovine growth hormone. Comparable results are obtained with other compositions of the invention.

Table III below which summarizes the milk production of these animals and demonstrates the effectiveness of the compositions of the invention for increasing the milk production of animals treated with these compositions.

TABLE II

Average[1] Bovine Growth Hormone Blood Levels in ng/ml (nanograms/ml)

Time After Treatment	A (Control)	B (Injected Day 0, 7, 14)	C (Injected Daily)
2 hr	2.9	7.1	23.0
4 hr	3.3	9.9	9.9
6 hr	2.8	21.6	5.7
1 day	3.2	65.4	4.4
2 day	2.9	36.4	4.5
3 day	2.8	16.3	4.6
4 day	2.5	16.5	4.6
5 day	3.2	26.1	7.6
6 day	2.7	12.9	3.1
7 day	4.5	17.6	5.3
14 day	3.9	22.9	8.7
18 day	8.1	31.6	10.7

1 Average of 3 animals rounded to the nearest 0.1

TABLE III

Weekly Average[1] Milk Production

Treatment	B Milk Kg	% Increase[2]	C Milk Kg	% Increase[2]
7 day pretreatment	22.33	-	23.39	-
Week one of treatment	24.77	10.9	27.81	16.8
Week two of treatment	26.81	20.1	29.97	28.1
Week three of treatment	26.26	17.6	28.32	21.0

[1]Average of three (3) cows

[2]Normalized increase over pretreatment levels

EXAMPLE 3

Sustained release of compositions of the invention in sheep

Utilizing essentially the same procedure as Example 1 the compositions listed in Table VI below are administered to two groups of sheep (three animals per group). Daily blood samples are obtained for a 5 day period and assayed for bGH blood levels as previously described. The results of these experiments which are summarized in Table V below; demonstrate the effectiveness of the compositions of the invention for maintaining elevated levels of growth hormone in the blood for extended periods of time.

TABLE IV

Compositions Administered

Composition	D	E
bgH	30 mg	30 mg
Dextrin	3 g	1.5 g
Carboxymethyl-cellulose	None	0.163 g
Carbonate Buffered Saline	To 5 ml	To 5 ml

TABLE V

Average[1] Bovine Growth Hormone Blood Levels ng/ml of Sheep

Composition	D	E
0 hr	4.1	2.6
2 hr	35.0	19.0
4 hr	39.0	23.0
6 hr	71.0	23.0
1 day	161.5	149.1
2 day	17.7	22.2
3 day	12.0	13.8
4 day	51.9	9.8
5 day	113.1	31.4

[1] Average of three (3) animals

EXAMPLE 4

Sustained release of compositions of the invention in sheep

Utilizing essentially the same procedure as Example 2 the compositions listed in Table VI below are administered to two groups of sheep (three animals per group). Daily blood samples are obtained for a 5 day period and periodically thereafter and assayed for bGH blood levels as previously described. The results of these experiments which are summarized in Table VII below, demonstrate the effectiveness of the compositions of the invention for maintaining elevated levels of growth hormone in the blood for extended periods of time.

TABLE VI

Compositions Administered

Composition	F	G	H
bGH	56 mg	63 mg	23.8 mg
heteropolysaccharide (Biopolymer PS-87 Lever Brothers Co)	100 mg	100 mg	100 mg
Water	5 ml	-	-
Carbonate Buffered Saline (CBS)	-	5 ml	-
70% Sorbitol/CBS	-	-	To 5 g

TABLE VII

Average[1] Bovine Growth Hormone Blood Levels
ng/ml of Sheep

Composition			
Day	F	G	H
0	2.4	1.3	4.5
1	152.4	103.4	140.9
2	38.2	32.9	53.8
3	20.0	23.1	36.7
4	18.1	17.3	30.7
5	17.1	14.7	25.1
6	10.0	12.3	28.4
8	18.3	22.9	29.6
10	97.2	18.8	26.0
13	14.7	16.2	11.9
15	9.8	11.6	9.6
17	7.7	11.0	8.3
20	9.1	9.2	5.8

[1]Average of three (3) animals

EXAMPLE 5

Sustained release of compositions of the invention in sheep

Utilizing essentially the same procedure as Example 2 the compositions listed in Table VIII below are administered to two groups of sheep (three animals per group). Daily blood samples are obtained for a 5 day period and periodically thereafter assayed for bGH blo d levels as previously described. The results of these experiments which are summarized in Table IX below, demonstrate the effectiveness of the compositions of the invention for maintaining elevated levels of growth hormone in the blood for extended periods of time.

TABLE VIII

Compositions Administered

Composition	I	J
bGH	64.4 mg	35 mg
Guar gum	250 mg	-
Carrageenan	-	125 mg
Saturated Boric acid solution pH 9.4	To 5 ml	-
Water	-	To 5 ml

TABLE IX

Average[1] Bovine Growth Hormone Blood Levels
ng/ml of Sheep

Composition		
Day	I	J
0	4.4	4.5
1	5.9	75.0
2	6.4	32.2
3	6.1	19.7
4	4.9	14.9
5	6.8	8.5
6	15.4	11.1
8	46.6	8.6
10	58.3	16.7
13	29.7	12.7
15	38.4	-
17	23.7	20.0

[1]Average of three (3) animals

EXAMPLE 6

Sustained release of compositions of the invention in sheep

Utilizing essentially the same procedure as Example 2 the compositions listed in Table X below are administered to two groups of sheep (three animals per group). Daily blood samples are obtained for a 5 day period and assayed for bGH blood levels as previously described. The results of these experiments which are summarized in Table XI below, demonstrate the effectiveness of the compositions of the invention for maintaining elevated levels of growth hormone in the blood for extended periods of time.

TABLE X

Compositions Administered

Composition	K	L	M	N	O	P
bSTH	51.8 mg	51.8 mg	51.8 mg	51.8 mg	23.8 mg	64.4 mg
Xanthan gum	150 mg	150 mg	150 mg	150 mg	125 mg	None
Locust Bean gum	100 mg	100 mg	100 mg	100 mg	None	250 mg
Water	To 5 g	None	None	2350 mg	None	To 5 ml
70% Sorbitol/water	None	To 5 g	None	None	None	None
Propylene glycol	None	None	To 5 g	2350 mg[2]	None	None
CBS/70% Sorbitol	None	None	None	None	To 5 g	None

[2]bGH dispersed/dissolved in water, gums dispersed in propylene glycol, and the aqueous solution is added to suspension.

0 193 917

TABLE XI

Average[1] Bovine Growth Hormone Blood Levels
ng/ml of Sheep

Composition Day	K	L	M	N	O	P
0	2.4	4.1	1.2	1.9	2.9	2.7
1	148.9	160.7	14.00	108.7	107.9	125.1
2	60.6	45.5	5.3	25.6	39.3	44.5
3	49.6	29.8	5.4	18.0	24.2	19.2
4	35.6	28.0	5.8	14.1	26.8	15.5
5	29.2	23.4	7.8	11.8	18.7	28.0
6	24.8	20.2	10.8	8.5	19.1	40.9
8	17.2	14.8	15.8	9.5	19.2	48.3
10	8.7	9.9	12.5	5.5	14.5	47.9
13	7.7	6.0	6.7	3.9	7.5	34.2
15	9.1	5.2	6.0	4.4	7.3	31.8
17	11.8	4.4	2.9	4.7	6.2	51.6

EXAMPLE 7

Evaluation of growth hormone compositions of the invention in dairy cows

Lactating cows are divided into groups of four or five. Throughout the test, all cows are fed the same ration of corn silage, alfalfa hay, and dairy concentrate adequate to produce 25 kg to 30 kg of milk per day. The cows are not treated for two weeks and daily milk production levels obtained for each group of animals. The experimental treatments listed in Table XII below are administered during week three, and milk production data for the treated animals and a group of untreated (control) animals recorded daily.

TABLE XII

Composition	Treatment Administered 1	2	3	4	5
bGH	350 mg	350 mg	350 mg	350 mg	350 mg
Xanthan gum	-	-	-	300 mg	300 mg
Locust bean gum	-	-	-	200 mg	200 mg
Heteropoly saccharide (Biopolymer PS-87 Lever Brothers Co)	500 mg	400 mg	200 mg	-	-
Water	To 25 g	To 20 g	To 10 g	-	-
70% Sorbitol/saline	-	-	-	To 10 g	-
Propylene glycol/saline	-	-	-	-	To 10 g

0 193 917

The results of these experiments which are summarized in Table XIII below summarizes the milk production of these animals and demonstrates the effectiveness of the compositions of the invention for increasing the milk production for extended periods of time of animals treated with these compositions.

TABLE XIII

Daily Average Percentage Increase in Milk Production over an Untreated Control

Treatment Day	1[3]	2[3]	3[3]	4[4]	5[4]
0	0.75	-.49	5.30	1.85	1.41
1	10.52	7.35	6.97	8.95	9.14
2	12.10	8.84	13.14	10.40	11.22
3	10.60	8.05	11.96	7.79	14.85
4	9.74	13.02	12.29	5.15	11.49
5	10.81	13.10	9.79	1.80	3.79
6	3.47	4.48	6.92	6.26	1.27
7	5.16	3.18	3.46	5.29	6.99
8	1.24	1.17	4.50	8.37	9.49
9	.03	0.55	-1.57	7.37	9.78
10	-3.26	-2.02	-2.14	5.78	6.11
11	1.51	-0.56	-.54	6.25	2.44
12	-.80	-3.44	-3.89	3.35	3.50
13	-1.12	-2.45	-5.42	5.17	-.32
14	-1.27	-0.22	-5.17	4.08	-1.04

[3]Average of four cows

[4]Average of five cows

EXAMPLE 8

1.2 g of the dextran PZ/9 (Reppe, Vaxjo) is dissolved in 1 ml water by heating. To the room temperatured solution, 100 µl bovine growth hormone (150 mg/ml) is added. After careful mixing the bovine growth hormone is determined with the help of an ELISA method. The result shows that only about 5% of the hormone added could be detected. When the detergent Triton X100 is added, in increments, the more detergent, added, the more hormone could be detected. At a detergent concentration of 4% all the added hormone could be detected, which indicates strong complex formation between the protein and the carbohydrate. The detergent Triton X-100 is used in biochemical work where dissociation of strong hydrophobic interactions is needed. If detergents which do not have this capability (e.g. TWEEN 80) is added a corresponding dissociation of the complex is not seen.

EXAMPLE 9

A mixture prepared by the procedure of Example 8 is kept in physiological buffer (PBS) for five days without adding any type of detergent, only 1% of the hormone added can be detected on day five. If now a 4% Triton solution is added one may, as was seen in Example 5 detect 100% of the hormone added.

Example 10

If the mixture according to Example 8 is kept for four days but with various and successively higher concentrations of Triton X100, the result is that with a concentration of 0.05%, about 5% of the hormone is dissociated and is detected with the ELISA determination. At a concentration of 0.08%, about 15% of the hormone has been released after five days, at the concentration of 0.25%, about 20% of the hormone is dissociated and at a concentration of 1% about 30% of the hormone has been dissociated from the complex.

EXAMPLE 11

If the dextran T500 (Pharmacia AB, Uppsala) with a concentration of 0.35 g/ml is used as the carbohydrate, a similar dissociation as described in Example 9 is seen.

EXAMPLE 12

If radioactively labelled hormone, is incorporated as described in Example 8 or 11 and the amount of radioactive material is determined after filtration through a 50 nanometer filter, the result is that 50% of the radioactivity passes through the filter. This indicates that despite half of the hormone passing the filter, only 10% of this fraction can be detected by the ELISA method, which means that 90% of the hormone in this fraction is hidden and can not be reached by the antibodies in the ELISA. The result indicates that the hormone is masqued or hidden for detection, since association between the protein and the antibody can not be obtained.

EXAMPLE 13

If the mixture according to Example 8 is injected as a single injection to a hypox rat, which has no production of growth hormone, a continuous growth over seven days is seen. In this case the total amount of hormone injected is 2 mg. If the same amount is injected without complex formation with a carbohydrate, the rat shows a rapid growth during the first 24 hours but after this the rat loses weight.

WHAT IS CLAIMED IS:

1. A biologically active composition with slow release characterized by including a water solution of a complex between a protein and a carbohydrate.

2. A biologically active slow release composition characterized by a mixture of water soluble or water dispersible carbohydrate polymer or mixture of carbohydrate polymers, and a biologically active macromolecule.

3. A composition according to Claim 2 wherein the biologically active macromolecule is present as a complex.

4. A composition according to Claim 2, wherein the mixture is present as a complex.

5. A composition according to Claim 4, characterized in that it also includes a hydrophobic or hydrophilic substance that may interact with the hydrophobic or hydrophilic interactions in the complex.

6. A composition according to Claim 2, wherein the macromolecule is a growth hormone, somatomedin, growth factor, or other biologically active fragment in water, an aqueous buffer solution, saline or a pharmaceutically or pharmacologically acceptable solvent or mixture thereof.

7. A composition according to Claims 4, 5 or 6, characterized in that the carbohydrate is starch or dextran.

8. A composition according to Claim 6 wherein the carbohydrate polymer is a dextran, dextrin, alginate, starch, fractionated starch, glycogen, pullullan, agarose, cellulose, chitosan, carrageenan, synthetic biopolymer, or a gum of xanthan gum, guar gum, locust bean gum, gum arabic, tragacanth gum or karaya gum, or derivatives or mixture thereof; and the growth hormone is bovine growth hormone, human growth hormone, ovine growth hormone, equine growth hormone or porcine growth hormone.

9. A composition according to Claim 8 wherein the carbohydrate polymer is a dextrin; the growth hormone is bovine growth hormone; the solvent is water or an aqueous buffer solution; the weight ratio of dextrin to bovine growth hormone is in the range of 0.25/1.0 to 100/1 and the water or aqueous buffered solution to carbohydrate polymer ratio is 0.83/1 to 40/1.

10. A composition according to Claim 8 wherein the carbohydrate polymer is a heteropolysaccaride of glucose, galactose, mannose, glucuronic acid and fucose; the growth hormone is bovine growth hormone; the weight ratio of heteropolysaccaride to bovine growth hormone is in the range of 0.25/1.0 to 100/1 and the water or aqueous buffered solution to carbohydrate polymer ratio is 0.83/1 to 40/1.

11. A composition according to Claim 8 wherein the mixture of carbohydrate polymers is a mixture of xanthan gum and locust bean gum; the growth hormone is bovine growth hormone; the weight ratio of the mixture to bovine growth hormone is in the range of 0.25/1.0 to 100/1 and the water or aqueous buffered solution to carbohydrate polymer ratio is 0.83/1 to 40/1.

12. A method for administering and maintaining elevated blood levels of biologically active macromolecules of growth hormone, somatomedin, growth factor or other biologically active fragment in animal, comprising parenterally administering to the animal, compositions of a water soluble or water dispersible carbohydrate polymer or a mixture of carbohydrate polymers; a biologically active macromolecule of growth hormone, somatomedin, growth factor, or other biologically active fragment in an effective amount for maintaining the elevated blood levels; and water, an aqueous buffer solution, saline or a pharmaceutically or pharmacologically acceptable solvent or mixtures thereof.

13. A method according to Claim 12 wherein the polymer is a carbohydrate polymer or a mixture of carbohydrate polymers, and the biologically active component is a growth hormone.

14. A method according to Claim 13 wherein the carbohydrate polymer is a dextran, dextrin, alginate, starch, fractionated starch, glycogen, chitosan, carrageenan, synthetic biopolymer, or a gum of xanthan gum, guar gum, locust bean gum, gum arabic, tragacanth gum, or karaya gum or derivatives or mixture thereof.

15. A method according to Claim 14 wherein the carbohydrate polymer is a dextrin, the growth hormone is bovine growth hormone and the solvent is water or an aqueous buffer solution.

16. A method according to Claim 14 wherein the carbohydrate polymer is a heteropolysaccaride of glucose, galactose, mannose, glucuronic acid and fucose, and the growth hormone is bovine growth hormone.

17. A method according to Claim 14 wherein the mixture of carbohydrate polymers is a mixture of xanthan gum and locust bean gum, and the growth hormone is bovine growth hormone.

18. A method for increasing weight gains in animals comprising parenterally administering to the animal a composition of a water soluble or water dispersible carbohydrate polymer or a mixture of carbohydrate polymers; a biologically active macromolecule of growth hormone, somatomedin, growth factor, or other biologically active fragments in an effective amount for maintaining increased weight gains; and water, an aqueous buffer solution, saline or a pharmaceutically or pharmacologically acceptable solvent or mixture thereof.

19. A method for increasing milk production in dairy cows comprising parenterally administering a composition of a mixture of a carbohydrate polymer or mixture of carbohydrate polymers and bovine growth hormone in an effective amount to increase milk production.

20. A method according to Claim 19 wherein the carbohydrate polymer is a dextran, dextrin, alginate, starch, fractionated starch, glycogen, pullullan, agarose, cellulose, chitosan, carrageenan, synthetic biopolymer, or a gum of xanthan gum, guar gum, locust bean gum, gum arabic, tragacanth gum or karaya gum, derivatives thereof or mixture thereof.

21. A method according to Claim 20 wherein the carbohydrate polymer is a dextrin.

22. A method according to Claim 20 wherein the carbohydrate polymer is a heteropolysaccharide of glucose, galactose, mannose, glucuronic acid and fucose.

23. A method according to Claim 20 wherein the mixture of carbohydrate polymers is a mixture of xanthan gum and locust bean gum.

24. A method of preparing a biologically active composition with slow release, characterized by, the protein being complexed to a carbohydrate in a water solution, optionally containing a hydrophobic and/or hydrophilic substance that may interfere with the hydrophobic or hydrophilic interaction in the complex.